

REMARKS

Claims 31-40 are currently pending in this application. Claims 31, 32 and 34-39 have been amended. No new matter has been added to the application.

Rejection of claims 31-35 under 35 U.S.C. §101

The Examiner has rejected claims 31-35 under 35 U.S.C. § 101 because the Examiner alleges that the claim is directed to a method which merely manipulates an abstract idea and produces no tangible result which is non-statutory matter. Applicants respectfully traverse the rejection.

The present invention is directed to a method for augmented reality guided positioning of a real instrument tip within a real target located in a real object. Applicants have amended the claims to more clearly distinguish the virtual aspects of the present invention, e.g., the graphics guide, from the real aspects, e.g., the instrument, target and object. Applicants respectfully submit that claims 31-35 are directed to using a virtual graphics guide to position a real instrument within a real target of a real object. As amended, claim 31 recites that once the real instrument is aligned, the real instrument is inserted into the real object at a predetermined depth based on the proximity of a real feature of the real instrument being aligned with a virtual depth marker. Applicants respectfully submit that claims 31-35 recite the physical act of inserting a real instrument into a real object at a predetermined depth with the aid of computer generated virtual graphics. However, contrary to the Examiners allegations, the claims do not merely recite an abstract idea; rather a method is recited for physically manipulating an instrument. Applicants respectfully submit that claims 31-35, as amended, recite statutory matter within the definition of 35 U.S.C. § 101 and request that the rejection be withdrawn.

Rejection of Claim 31-40 under 35 U.S.C. § 102 (e)

The Examiner has rejected claims 31-40 under 35 U.S.C. § 102 (e) as being anticipated by U.S. Patent No. 6,470,207, (Simon). The Examiner contends that Simon discloses Applicants' invention as claimed. More specifically, the Examiner contends that the virtual cone in Simon's system is analogous to the virtual depth marker recited in Applicants' claims. Applicants respectfully traverse the rejection.

Applicants' invention is directed to a method and apparatus for augmented reality guided positioning of an instrument tip within a target located in an object. An augmented reality view is presented by overlaying a virtual graphics guide onto a real view of the object and an instrument. The graphics guide comprises a virtual depth marker located outside of the object. The instrument is aligned to the graphics guide. The instrument is inserted to a depth determined in the augmented view by alignment of a predetermined feature of the instrument with the virtual depth marker. The feature is located along the length of the instrument at a certain distance from the instrument tip and remains external to the object during insertion.

Simon discloses a surgical navigational guidance system which uses one or more fluoroscopic x-ray images. Representations of surgical instruments are overlaid on pre-acquired fluoroscopic images of a patient based on the position of the instrument as determined by a tracking sensor. This allows the physician to see the location of the instrument relative to the patient's anatomy as depicted in the fluoroscopic X-ray images. Simon uses a virtual cone as a mathematical reference to the volume that is being imaged by the X-ray imaging system. The location and opening angle of the virtual cone determine the field-of-view of the X-ray system. Simon determines the coordinates of the virtual cone with respect to the coordinate system of the tracking system so that he can overlay a virtual model of the tracked instrument spatially correct onto the X-ray image of the

patient's anatomy. Tracking of the instrument is a prerequisite for Simon's method.

Applicants respectfully submit that the Simon system is very different than that of the present invention. The present invention is an augmented reality system that allows a user to determine the depth of an instrument being inserted into an object from an external perspective. The depth marker is explicitly shown to the user and used to guide the instrument to the target. The present invention also does not track the coordinates of the instrument; the alignment of the virtual depth marker with the real feature on the real instrument indicates correct depth placement of the instrument.

Simon uses the virtual cone to illustrate the volume that is being imaged by the X ray system and which is then determined in the coordinates of the tracking system. Unlike the present invention, the virtual cone is not shown to the user and therefore cannot provide any guidance to the user; in particular, it does not serve as a depth marker. As indicated in column 12, lines 10-23, the virtual cone is known in the coordinate system of the tracking system. The cone is used to understand the spatial relationship of the X-ray system's field-of-view with the tracked position of the instrument, which allows one to indicate the instrument position in the fluoroscopic image with a virtual instrument.. The virtual instrument can be used by the physician to guide the trajectory of the real instrument.

This is fundamentally different from the present invention. The present invention does not use a virtual instrument to guide the positioning of the real instrument in the target. The only tool used to position the real instrument in the present invention is the virtual graphics guide with the virtual depth marker. The alignment of the virtual depth marker and the feature on the instrument ensures that the instrument has been inserted at the appropriate depth to reach the target. Unlike Simon, the present invention does not allow the user the virtually

see the instrument within the patient. Nor does the present invention use a virtual instrument to guide the insertion of the real instrument.

Simon does not teach or disclose aligning a virtual depth marker located outside of a real object with a feature of a real instrument in order to position a real instrument tip within a real target in a real instrument as recited in amended claims 31 and 36. Claims 32-35 and 37-40, being dependent upon independent claims 31 and 36 respectively, are also not taught or disclosed by Simon. Applicants respectfully submit that Simon does not teach or disclose Applicants' invention as claimed and request that the rejection under 35 U.S.C. § 102 (e) be withdrawn.

Conclusion

Applicants respectfully submit that claims 31-40 are in condition for allowance and request that a timely Notice of Allowance be issued in this case. The Examiner is invited to contact the undersigned should he have any questions in this matter.

Respectfully submitted,



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